GEOMETRIC CURVES AND CURVED CONIC SECTIONS.

In the course of a paper on this subject, read recently at the Society of Arts, Mr. Jopling explained some of his recent discoveries in reference to curved conic sections. He considers all the curves in the Septenary System to be projections, in some way, of either plane or curved sections of cones. They are also all producible by rolling curves on each other, the forms of which can be ascertained by the motions included in the Septenary System.

By means of a hollow cone and diagrams, he showed how the conic surface has the property of changing lines applied to it into varying curves. For example, circular lines on the development, when applied to the conic surface were so changed as to give, by appearance, or radial projection, and orthographical projection, cuspidated, nodated, and inflected cardioids, together with numerous other curves, in gradual connection, but which are yet without distinguishing names. He exhibited examples of parallel spiral lines of several revolutions, varying in curvature throughout, which were produced by applying to the cone lines which on the developed surface were simply concentric circles. By applying eccentric circular lines, tapering spirals were obtained. A simple right line on the developed surface was shown to be changed into a curve, all the projections of which are probably contained in the Septenary System. In a similar way he showed that by other lines on the developed surface, as the ellipse, hyperbola, and parabola, when applied to the cone, great varieties of lines can be exhibited to the eye and projected on planes in any position. The appearances of a hollow cone cut to the line of a circular disc applied to its surface, showed what a great variety of forms can be obtained from one curved section.

Other varieties of curves were shown by hollow metal cones cut to the lines produced by their intersection with a cylinder and a sphere; and projections of the latter line were shown to be the cuspidated, nodated, inflected, and oblate forms of the cardioid known to mathematicians.

All these varieties can be obtained from cones of different angles by varying the diameters of the intersecting spheres.

In developing on a diagram such an intersected cone, drawn with rays at equal angles, the lengths of the rays, either on the plane of development, the surface of the cone, or any plane on which the intersection may be projected, are obtained by the use of a scale of sines.* The peculiar cardioids just spoken of are produced by orthographical projections on the plane of the base.

The following is a table of cardioids produced by applying to the interior or exterior surface of a cone the known plane conic sections:—

I. By the application of the plane conic sections, as cloaks or linings to the cone.

1st. The circle.
2nd. The ellipse, prolate, oblate, and dissymmetrical.
3rd. The parabola, } infinite cardioids.
4th. The hyperbola, }

II. By making the profile of a curved section of a cone a plane conic section.

1st. A circular line, as an intersection with a cylinder.
2nd. An elliptical line, prolate, oblate, and dissymmetrical, as an intersection with an elliptical prism.
3rd. A parabola, as an intersection by a parabolic prism, which gives the cardioid known to mathematicians.
4th. A hyperbola.

III. By making the profile of a curved section of a cone an intersection of a solid.

1st. The intersection of a sphere.
2nd. A spheroid, prolate, oblate, or dissymmetrical.
3rd. A paraboloid, ditto, ditto.
4th. A hyperboloid, ditto, ditto.

Mr. Jopling said,—The field for experiment and observation in producing curves is most extensive, and there is plenty of room for others to advance and distinguish themselves by discoveries, both within and beyond the bounds defined by the Septenary System; but it is submitted that a knowledge of the more simple and practical principles which it embraces will materially assist in the discovery and thorough understanding of all relative subjects.

There is very little doubt that much of the mathematical knowledge possessed by the Greeks, as well as their method of reducing it to practice, is now lost to us, from the imperfect means of recording it which they had at their command. It is certain that the eminence to which they attained in practical art of all kinds is due to their geometrical knowledge; and it therefore appears as certain that by a revival of such knowledge a great impulse would be given to art among us. The great features in civil and naval architecture may be varied and improved; the beauty and elegance of form in ancient vases may be equalled, and perhaps surpassed in variety and character; and in the outline and general arrangement of architectural and artistic design, in the accuracy of the most delicately varying curves, and in the minutest details, the utmost perfection may be obtained by the study of true lines.

No one can have been properly educated in 'perception' of form who cannot see the existence of the various points of change that occur in curved lines, or with the points and lines of change that compose curved surfaces; and these cannot be explained or properly comprehended without studying a variety of the most correct examples of curves, and first on a large scale.

* Wherever may be the nature of the conic section, a scale may be formed from the rays which, on the elevation, are cut by the section; by which points may be obtained in the corresponding rays on the base, and a projection of the curve constructed, and this for any projection or development. In some cases the scale on the base may be a scale of equal parts, in others a scale of chords, of sines, tangents, secants, &c., deduced from the circle.

EGYPT AND EGYPTIAN ANTIQUITIES.

Dr. J. V. C. Smith, the editor of the Boston *Medical Journal*, U.S., has been travelling in Egypt, and has addressed a series of letters on the subject to the Boston *Traveller*. From these we condense the following notes and observations:—

Abbas Pasha, the present ruler of Egypt, a grandson of Mahommed Ali, appears to care for nothing beyond the multiplication of palaces, which he is rearing in singular places at enormous cost, at the expense too of his hard-worked subjects. One is going up outside the northern wall of Cairo; another has been finished in the desert towards Suez; and a third is rising rapidly for the enlargement of his mother's residence near the border of a garden on the Boulac side of the city. Mechanics are compelled to labour, being brought from the towns and villages, whether they are willing to go or not, at a compensation of about ten cents a-day, rarely twenty-five, payable half in bread, daily, at his own price: for the remainder, an order on the treasury is given, that they are obliged, from necessity, to sell at any price to speculators, so that they are virtually cheated out of the whole. The machinery of Government in respect to the grain and cotton monopoly remains precisely as he found it. He adds nothing, improves nothing that is defective, has suspended public works that were judiciously commenced, and assesses whatever sums he chooses, which the people must pay.

Grand Cairo, the capital, is made up of a singular mass of odd-looking and more oddly contrived half stone, half brick and mud houses. Some rather fine edifices are met with, however, but they are novelties. The streets rarely exceed 5 feet in width. In the thickest of the town, the dwellings by jutting-out stories as they ascend, touch at the top, 'almost to the exclusion of the sun's rays.' Whatever is new there, is fabricated out of something old. Thus a new house is made of stone, brick, and mortar that may have figured a hundred times before. Wherever there has been a town in Egypt, however remote the epoch of its existence, there is from one to several mounds of enormous size, varying from 10 to 150 feet in height, which appear to be wholly formed of broken bricks, pieces of dressed and other kinds of stone, fragments of pillars, cornices, and smashed red earthen vessels. Whoever wishes to erect an edifice has only to tap one of these anomalous piles of rubbish to procure materials. Thus the walls of a modern stable may once have been walls in the palace of Menes, the first king; next in Shishak's, and by and by they will be liberated from their present ignoble durance to take a new position in a future cycle. Hundreds of small boys and girls are employed in carrying trays of mortar on their heads, marshalled by overseers, who direct their movements with a stick. They pour down the contents on the top of the uprising work. A mason plumps a stone into it with his hands, trowels rarely being in requisition in ordinary undertakings. Women are seen mixing mortar with their hands in sufficient quantity to keep the workmen liberally supplied.

One straight street had been commenced in Cairo before Mahommed Ali's death: no one knows when it will be finished. Alexandria was re-laid out by the same master spirit, and from its excellent harbour, fine commercial advantages, and the only seaport worth having in Egypt, I imagine it will again become the capital, as it once was, to the neglect of Cairo, which is in a waning old age.

Some of the guide-books speak in terms of admiration of the public fountains, and they either wilfully or ignorantly misrepresent them. All the water in Egypt raised above the level of the Nile is in earthen pots on the rim of a wheel, or by a pole and bucket. Thus elevated, there are troughs in mosks, rarely anywhere else, to which it is conducted—unless the sakias near the gardens are reckoned as fountains. Water is poured out of skins into tanks within very many of the mosks, with which two small tubes communicate that jut out through the wall. Poor people apply their mouths and suck up the water. These contrivances are the gift of pious Mahommedans who look for favours in return from the Prophet for such charities on earth.

Roman Catholics—mostly Italian residents—are pretty numerous, especially in Alexandria, where they have a very large, beautiful church, the bell of which is the only one, perhaps, in the country. A fine episcopal church edifice has been half finished on the Consular square, from stone brought from Malta a long while ago. Some disagreement among the proprietors interrupted the progress of the enterprise. The society is rather a feeble one, quite thrown into the shade by their neighbours the Papists.

Before bringing these observations to a *finale*, it may be acceptable to know something of the present condition of the antiquities of Egypt—those most prominent. Nearly all the temples, large and small, are covered up with sand, while the interiors are filled with broken bricks, stones, dust, bones, and a mixture of nameless stuff, with the exception of the magnificent, unequalled remains at Karnak and Thebes. Those at Luxor are partly hidden by accumulations of mud and filth,—while the apartments, the loftiest, grandest imaginable, that surpass the noblest specimens of architecture to be found on the globe, are occupied by beggarly Arabs, for themselves, their donkeys, goats, turkeys, and dogs. On the roof of the beautiful temple of Dendara, from which the French during their sway wrenched the unique planisphere, the gem of the Bibliotheque in Paris, there are the foundations of large brick dwellings that may have been inhabited for centuries, and the occupants quite ignorant of the beautiful columns, the rich sculptures and splendid adytum below their feet. At Edfou there is a great structure—glorious,—altogether so: to imitate it in our day, with all the appliances of modern art, would exhaust the resources of a nation, if an attempt were made to copy minutely the finish of those sands upon thousands of hieroglyphical figures in relief. Covered up as it is by a mountain of rubbish, it would not be a very costly affair to clear it all away, and the missing stones of the great prostyle, a gateway well nigh one hundred feet high, might be tolerably well imitated